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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/941,533	08/29/2001	Ammar Derraa	MTI-31533	4578

31870 7590 07/11/2005

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EXAMINER

FOURSON III, GEORGE R

ART UNIT PAPER NUMBER

2823

DATE MAILED: 07/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/941,533	DERRAA, AMMAR	
	<b>Examiner</b>	<b>Art Unit</b>	
	George Fourson	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 03 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-73 and 101-129 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-73 and 101-129 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/3/05 has been entered.

Claims 1,2,3-9,11,12,13,14,16,17,18,19,21,22,23,24,26,27,28,30,31,33,34,35,37,38,40-45,49,68,71,101-105,112,114,116,120 and 121 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in view of Hu et al.

The rejection is maintained as stated in the paper mailed 2/3/05.

Wang discloses treatment of a contact having a thickness up to 1000 angstroms [0024][0048].

Hu exemplifies treatment of a 1400 angstrom film (fig.3 and col.5, line 49) at "about 680°C" (col.5, line 31) which includes some variation from 680°C in view of use of the term "about". The recited temperature of 700°C would not have been expected to materially alter the treatment step because the difference in temperature between "about 680°C" and 700°C would not have been expected to be large enough to impart substantial differences in the effects of the step. Furthermore, it appears that 680°C treatment is exemplified to simplify the process by using the same temperature as the deposition temperature in the "Example" ("maintained", col. 6, line 64). Note that the deposition temperature is disclosed to be 550-720°C (col.6, lines 23-24). Therefor, it appears that there is overlap between the disclosed deposition temperature range, and therefor the temperature range of the heat treatment, and that disclosed by the reference. If overlap is not disclosed one of ordinary skill in the art would have been led to

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the recited temperature when using deposition temperatures over 700°C to simplify the process of forming the contact.

Claim 115 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in combination with Hu et al as applied to claims 1,2,3-9,11,12,13,14,16,17,18,19,21,22,23,24,26,27, 28,30,31,33,34,35,37,38,40-45,49,68,71,101-105,112,114,116,120 and 121 above, and further in view of Leem or Japan 5-267220.

The rejection is maintained as stated in the paper mailed 2/3/05 and as stated above. In addition to suggesting incorporation of B in the film of Wang et al It would have been obvious to one of ordinary skill in the art to form a 100 angstrom Ti-B-N barrier layer as part of the contact structure of Wang et al in view of the teachings of Leem and Japan '220 that Ti-B-N is a conductive material useful in a contact structure.

Applicant argues that there is no disclosure in Leem or Japan 5-267220 related to use of boron-doped titanium nitride to fill the entire opening. However, neither of the references is alleged to contain such a teaching. Leem or Japan '220 are relied on as providing motivation to incorporate boron in the TiN material of Wang et al in view of Hu et al in at least one of the deposition/treatment steps with a reasonable expectation that the resulting Ti-B-N material would have the necessary properties to function as a layer in the contact of Wang et al. Leem expresses a preference for Ti-B-N films less than 100 angstroms thick (col.2, line 36) but characterization of embodiments as non-preferred does not constitute a teaching away. In view of the material being used in a contact structure It would have been obvious to one of ordinary skill

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in the art to employ the material in the contact structure of Wang et al or, alternatively, to modify the contact material of Wang et al to include incorporation of B.

Claims 10,15,20,25,29,32,39,50,51-59,61,62,63,67,66,69,70,73,106,107,108,109,72,110,111, 113,117,118,119,122,123,128 and 129 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in combination with Hu et al as applied to claims 1,2,3-9,11,12,13,14,16,17, 18,19,21,22, 23,24,26,27, 28, 30,31,34,35,37,38,40-45,49,68,71,101-105,112,114,116,120 and 121 above, and further in view of Leem or Japan '220.

The rejection is maintained as stated in the paper mailed 2/3/05 and as stated above.

Claims 36,46,47,48,64 and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in view of Hu et al as applied to claims 1,2,3-9,11,12,13,14,16,17,18,19,21,22,23,24,26,27, 28,30,31,33,34,35,37,38,40-45,49,68,71,101-105,112,114,116,120 and 121 above, and further in view of Doan et al.

The rejection is maintained as stated in the paper mailed 2/3/05 and as stated above.

Claims 60,124,125,126 and 127 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al as applied to claims 1,2,3-9,11,12,13,14,16,17,18,19,21,22,23,24,26,27, 28,30,31,33,34, 35,37,38,40-45,49,68,71,101-105,112,114,116,120 and 121 above, and further in view of AAPA.

The rejection is maintained as stated in the paper mailed 2/3/05 and as stated above.

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The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yokoyama 4897709 cited by applicant discloses formation of TiN at 200-900°C (col.4, lines 54+). Eichman 5279857, cited by applicant, teaches thermal anneal at 600-700°C (col.3). Both of Japan 10-172924 and 10-223563, cited by applicant, disclose reducing Cl content in a TiN film.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (571) 272-2800. See MPEP 203.08.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner George Fourson whose telephone number is (571)272-1860. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (571)272-1855. The fax number for this group is (571)273-0224 and the customer service number for group 2800 is 571-272-2815. Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.

  
George Fourson  
Primary Examiner  
Art Unit 2823

GFourson  
July 5, 2005